Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] A method for operating a satellite comprising:
pressurizing a first tank with a pressurant thereby establishing a pressure differential between a first propellant tank and a second propellant tank;
transferring propellant from a first tank to a second tank;
using propellant in the second tank for orbit maintenance; and
using propellant in the first tank for end-of-life maneuvers.

[c2] A method as recited in claim 1 wherein establishing a pressure differential comprises heating the second tank.

[c3] A method as recited in claim 1 further comprising after the step of transferring, burning to depletion propellant in the first tank and transferring propellant from the second tank to the first tank.

[c4] A method as recited in claim 3 further comprising after the step of burning, venting the first tank.

[c5] A method as recited in claim 3 wherein transferring propellant from the second tank to the first tank comprises

equalizing pressure between the first tank and the second tank.

[c6] A method as recited in claim 5 wherein equalizing pressure comprises opening latch valves for a predetermined amount of time.

[c7] A method as recited in claim 1 wherein establishing a pressure differential comprises expelling helium from the first tank.

[c8] A method as recited in claim 1 wherein establishing a pressure differential comprises opening at least one valve between a pressurant and the first tank.

[c9] A method as recited in claim 8 wherein transferring propellant comprises transferring a known amount.

[c10] A method as recited in claim 9 wherein transferring a known amount comprises opening latch valves for a predetermined amount of time.

[c11] A method as recited in claim 1 wherein the first propellant in the first tank is the same as the propellant in the second tank.

[c12] A method as recited in claim 1 wherein the satellite comprises a three axis satellite.

[c13] A method as recited in claim 1 wherein the satellite comprises a spinning satellite.

[c14] A method as recited in claim 1 wherein using the propellant in the second tank comprises measuring the amount of propellant used in the second tank until the second tank is emptied to determine the amount in the first tank.

[c15] A method as recited in claim 14 further comprising after using the propellant in the second tank, transferring a portion of the propellant from the first tank to the second tank.

[c16] A method as recited in claim 1 further comprising maintaining a nominal tank pressure in the first tank.

[c17] A method as recited in claim 1 further comprising maintaining a nominal tank pressure in the second tank.

[c18] A method as recited in claim 1 further comprising maintaining a nominal tank pressure to maintain thruster performance.

[c19] A method as recited in claim 1 further comprising determining a first amount of propellant in the first tank and a second amount of propellant in the second tank.

[c20] A method as recited in claim 19 determining a first

amount of propellant in the first tank and a second amount of propellant in the second tank comprises using modeling.

[c21] A method for operating a satellite having a first propellant tank and a second propellant tank comprising:
opening a valve between a pressurant source and a first tank;
pressurizing a first tank from the pressurant source;
establishing a pressure differential between a first propellant tank and a second propellant tank;
closing the valve;
transferring propellant from the first tank to the second tank by controlling valves therebetween;
using propellant in the second tank for orbit maintenance; and
using propellant in the first tank for end-of-life maneuvers.

[c22] A method as recited in claim 21 further comprising after the step of transferring, burning to depletion propellant in the first tank and transferring propellant from the second tank to the first tank.

[c23] A method as recited in claim 22 further comprising after the step of burning, venting the first tank.

[c24] A method as recited in claim 22 wherein transferring propellant from the second tank to the first tank comprises equalizing pressure between the first tank and the second tank.

[c25] A method as recited in claim 24 wherein equalizing pressure comprises opening latch valves for a predetermined amount of time.

[c26] A method as recited in claim 21 further comprising maintaining a nominal tank pressure in the first and second tank to maintain thruster performance.

[c27] A method as recited in claim 21 further comprising determining a first amount of propellant in the first tank and a second amount of propellant in the second tank.

[c28] A method as recited in claim 27 determining a first amount of propellant in the first tank and a second amount of propellant in the second tank comprises using modeling.

[c29] A satellite comprising:
a first propellant tank;
a second propellant tank;
a pressurant source having pressurant therein;
a first valve coupling the pressurant source to the first tank;

a plurality of valves coupling the first tank to the second tank;

a controller coupled to the first valve and the plurality of valves, the controller programmed to open a valve between a pressurant source and a first tank to pressurize a first tank from the pressurant source and establish a pressure differential between a first propellant tank and a second propellant tank, said controller programmed to close the valve and control the plurality of valves to transfer a known amount of propellant from the first tank to the second tank, said controller programmed to use the propellant in the second tank for orbit maintenance and use the propellant in the first tank for end-of-life maneuvers.

[c30] A satellite as recited in claim 28 wherein said controller controls the first valve to maintain a nominal tank pressure to maintain thruster performance.

[c31] A satellite as recited in claim 29 wherein the satellite is a spinning satellite.

[c32] A satellite as recited in claim 29 wherein the satellite is a three-axis satellite.

[c33] A satellite as recited in claim 29 further comprising a heater coupled to the controller, said controller increas-

ing a tank pressure using said heater.

[c34] A satellite as recited in claim 29 wherein said controller determines a first amount of propellant in the first tank and a second amount of propellant in the second tank.

[c35] A satellite as recited in claim 29 wherein after transferring propellant the controller is programmed to burn to depletion propellant in the first tank and transfer propellant from the second tank to the first tank.

[c36] A satellite comprising:
a first propellant tank;
a second propellant tank;
a plurality of valves coupling the first tank to the second tank;
a controller coupled to the first valve and the plurality of valves, the controller programmed to empty the first tank, establish a pressure differential between a first propellant tank and a second propellant tank, transfer a known amount of propellant from the second tank to the first tank by controlling valves, use the propellant in the second tank for orbit maintenance; and use the propellant in the first tank for end-of-life maneuvers.

[c37] A satellite as recited in claim 36 wherein the satellite is a spinning satellite.

[c38] A satellite as recited in claim 36 wherein the satellite is a three-axis satellite.

[c39] A satellite as recited in claim 36 further comprising a heater coupled to the controller, said controller increasing a tank pressure using said heater.

[c40] A satellite as recited in claim 36 wherein said controller determines a first amount of propellant in the first tank and a second amount of propellant in the second tank.